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CHECKLIST AND CATALOGUE SERVICE

2-ETHOXYETHANOL

CATEGORIZATION AS A HAZARDOUS INDUSTRIAL WASTE AND AS A HAZARDOUS WASTE CHEMICAL

THE PROPOSAL

The Ontario Ministry of the Environment administers the *Environmental Protection Act*. Schedule 1 of Regulation 309 made under this act lists some industrial processes in which hazardous wastes are generated. Waste streams from these processes typically have a high concentration of hazardous chemicals. Schedule 2 on the other hand lists actual hazardous waste chemicals.

The Ministry is proposing to categorize wastes from industrial processes using 2-ethoxyethanol as a solvent as "hazardous industrial wastes". This would be done by listing these processes in Schedule 1 of the regulation. It is further proposed to list the waste chemical itself in Schedule 2.

2-ethoxyethanol is a commonly used solvent known under a variety of trade names including, Cellusolve, Dowanol, Oxitol, and Poly-solo. It is sometimes referred to as ethyl glycol, but should not be confused with ethylene glycol.

Companies using a mixture of this chemical as a solvent would be required to comply with the provisions of Regulation 309 concerning the disposal of hazardous wastes if these processes were listed in Schedule 1.

Manufacturers using 2-ethoxyethanol as a component may produce, from time to time, commercial products containing it that are off-specification or otherwise unusable. These products become wastes and would be classified as hazardous waste chemicals if this chemical were listed in Schedule 2. Users and distributors of the

chemical would also generate waste when the products become outdated or when their shelf life has expired. The disposal of all such wastes would be covered by the provisions of Regulation 309.

For an explanation of the two ways, categorization and review in which the schedules in the Regulation may be updated you are referred to the Ministry's publication, *A Guide to Hazardous Waste Categorization and Review*.

THE CATEGORIZATION PROCEDURE

The updating of a Schedule by categorization begins with an application in writing to the hazardous waste review unit (HWRU) at the Waste Management Branch, Ministry of the Environment. Applications may come from agencies having regulatory responsibility for health and the environment, from concerned organizations, or from the public at large.

Upon receipt of an application the HWRU prepares a Categorization Background Document. This document provides an extensive evaluation of the data on toxicity of the contaminant in question, and on its potential impact on human health and on the environment. If in the opinion of the HWRU there are sufficient grounds to proceed further, the application is evaluated by the hazardous waste review committee (HWRC) consisting of representatives of the Waste Management Branch, other Ministry of the Environment branches, and the Ontario Ministry of Labour. It may also be circulated to other environmental services branches within the Ministry for technical evaluation. Following this evaluation the HWRC submits a recommendation for approval to the director of the Waste Management Branch.



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If the case is considered to be urgent, the approved recommendation is forwarded directly to the Minister of the Environment, who makes the final decision.

An important part of the categorization procedure followed in less urgent cases is full consultation with the public before any final action is taken. Opinions expressed as a result of this consultation will be reviewed, together with the recommendation of the internal committee and other information, by an independent Hazardous Waste Advisory Committee. This committee, made up of persons from the scientific and academic communities and from public interest groups, makes the final recommendation to the Minister of the Environment regarding the proposed categorization.

Selected properties of 2-ethoxyethanol

Chemical formula : $C_4H_{10}O_2$
Density : 0.928 g/cc
Melting point : -70°C
Boiling point : 135.5°C
Solubility (in water) : complete
Flash Point : 42.7°C
Volatility : vapour pressure 3.8 mm Hg at 20°C

USES

2-ethoxyethanol is used in the production and use of paints and other coatings, of ink, and of some other organic materials.

It is proposed to include in Schedule 1 only those industrial processes in 2-ethoxyethanol is used as a solvent as distinct from those in which it is a component of the final product.

Uses typical of those to be covered would be the cleaning of production or printing machinery.

Although it may represent as much as 32 per cent of some manufactured products by volume, its use as a component of coatings, ink, or other materials would not be affected by its proposed categorization in Schedule 1. The management of any wastes consisting of off-specification or otherwise unusable material would, however, be required to comply with Regulation 309 if it were categorized as a hazardous waste chemical and so listed in Schedule 2.

Its relative use by industry is estimated as:

- 88% for protective coatings,
- 6% for printing inks,
- 6% for other solvent uses.

PRODUCTION

2-ethoxyethanol is not produced in Canada but 857 tonnes of the solvent were imported in 1987. In the United States there are five firms producing it on a commercial scale.

2-ETHOXYETHANOL AS A WASTE

Wastes contaminated with 2-ethoxyethanol come from three principal sources. The annual contributions from each of these is estimated for Ontario as follows:

- Paint/coating production and use;
 - 38.8 tonnes (spent solvent and still bottoms),
 - 14.9 tonnes (off-specification product);
- Ink production and use;
 - 3.0 tonnes (spent solvent and still bottoms),
 - 1.2 tonnes (off-specification product);
- Organic syntheses and miscellaneous processes;
 - 4.3 tonnes (spent solvent and still bottoms).

The concentration of 2-ethoxyethanol in the total waste varies widely. Still bottoms may contain as little as one per cent of the chemical, while the spent solvent itself may contain as much as 90 per cent 2-ethoxyethanol. These, together with off-specification product, make up the total waste of about 62 tonnes. The best estimate is that on average that this contains about thirty per cent of the solvent, a total of some 40 tonnes of 2-ethoxyethanol.

Much of this 40 tonnes is recovered by distillation, but still bottoms, the residues of the distillation process, remain. Until the chemical is categorized as proposed these residues may be disposed of in landfills. Mismanagement in the handling could create a risk due to the ignitability of the solvent or lead to the risk of exposure through pollution of groundwater.

HEALTH HAZARDS OF 2-ETHOXYETHANOL

The Ministry of the Environment uses a rating system to assess the different types of hazard to human health from toxic substances. This assigns a score from zero, representing no risk, to ten for maximum risk for each hazard, based on the results of laboratory tests. If the score is above a given level, referred to as the concern level the substance is considered to present a significant risk with respect to that type of hazard.

Those given non-zero scores with respect to 2-ethoxyethanol included:

Acute lethality, which is the hazard of death from a single dose, scored 2 with a concern level of 6. The score was based on the results of tests on mice, rats and guinea pigs.

Sub-lethal effects such as changes in rate of growth or of bodily functions, may be noted in tests on animals, both mammals and non-mammals, or on plants. 2-ethoxyethanol caused slight effects on the blood of rats and rabbits, some reduced body weight in rats, and was possibly responsible for enlarged adrenals in male rats. These effects were not considered very serious so that the score for sub-lethal effects on mammals was set at 2 against a concern level of 4.

Mutagenicity, the capability of causing genetic changes, was shown in some but not in all of the studies done. The mutagenicity of this chemical is scored at 8, above the concern level of 6.

Teratogenicity, the capability of causing the death or malformation of a fetus, or death immediately following birth, was observed in a high percentage of tests. As a result teratogenicity was scored at 6, well above the concern level of 2 for this hazard.

OTHER HAZARDOUS PROPERTIES OF 2-ETHOXYETHANOL

According to Regulation 309 a waste is considered hazardous if it exhibits at least one of the following characteristics: corrosiveness, ignitability, reactivity, or leachate toxicity. Of these ignitability is exhibited by 2-ethoxyethanol. Because of this and because of the scores noted above, some aspects of its environmental behaviour become of concern when the disposal of wastes containing it are considered.

Characteristics of environmental behaviour significant in waste management can be identified and scores assigned.

Environmental mobility refers to the dispersion of a material in water and in air. 2-ethoxyethanol while highly soluble in water is not volatile, and thus receives a score of 0 for mobility against a level of concern of 7.

Environmental persistence of a pollutant is a measure of the length of time before the substance degrades

to some less harmful compounds or elements. 2-ethoxyethanol does not break down in water, but is degenerated by biological agents when in solution in water. The low level of biological activity typical of groundwater makes this degeneration a slow process. It is not volatile so that although it is susceptible to degradation in the atmosphere this is ineffective. Thus it is considered to be moderately persistent, scoring 4 against a concern level of 7.

Environmental exposure is a measure of the potential that humans or other organisms will actually come into contact with a hazardous chemical waste. Because of its complete solubility the risk of exposure through pollution of groundwater is high and 2-ethoxyethanol is scored at the concern level of 7 for environmental exposure.

PRESENT REGULATIONS

2-ethoxyethanol is classified as a flammable liquid under the federal *Transportation of Dangerous Goods Act*, identified as being moderately flammable for international air transport and international marine transport of waste. It is not now listed as an environmentally hazardous substance nor as a miscellaneous dangerous good under any Canadian legislation.

It is listed in the U.S. as a hazardous waste under their *Resource Conservation and Recovery Act* if disposed of as a spent solvent or as still bottoms.

CONCLUSIONS AND RECOMMENDATIONS

It is concluded that the potential release of waste contaminated with 2-ethoxyethanol in the environment presents a significant risk because of its teratogenic and mutagenic effects and its ignitability, made more serious by its persistence and the probability of environmental exposure. These considerations justify the recommendation that 2-ethoxyethanol be listed in Schedule 1 and Schedule 2, part B of Regulation 309 under Ontario's *Environmental Protection Act*.

For more information contact:
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